

Linear measurements may be made by electronic measuring devices attached to a vehicle.

Thermoplastic traffic stripe, complete in place and accepted, is measured as follows:

#### A. Solid Traffic Stripe

Stripe is measured by the linear foot (meter), linear mile (kilometer), or square yard (meter). Breaks or omissions in solid lines or stripes at street or road intersections are not measured for payment.

#### B. Skip Traffic Stripe

Skip stripe is measured by the gross linear mile (kilometer) as specified. The unpainted space between the painted stripes is included in the overall measurement if the Plan ratio of one to three (10 ft [3 m] segment and 30 ft [9 m] gap or other patterns as designated on the Plans) remains uninterrupted. Measurement begins and ends on a stripe.

#### C. Words and Symbols

Each word or symbol complete according to Plan dimensions is measured by the Unit.

### 653.4.01 Limits

General Provisions 101 through 150.

### 653.5 Payment

Payment is full compensation for the Work under this section, including:

- Cleaning and preparing surfaces
- Furnishing all materials
- Applying, curing, and protecting stripe
- Protecting traffic, including providing necessary warning signs
- Furnishing tools, machines, and other equipment necessary to complete the Item

Measurement and payment for removing pavement markings will be according to Section 656 when shown in the Proposal as a payment Item. Otherwise, removal will not be paid for separately, but will be included in the payment for other Work under this section.

Payment will be made under:

Item No. 653	Thermoplastic solid traffic stripe, ___ in (mm), (color)	Per linear foot (meter)
Item No. 653	Thermoplastic solid traffic stripe, ___ in (mm), (color)	Per linear mile (kilometer)
Item No. 653	Thermoplastic skip traffic stripe, ___ in (mm), (color)	Per gross linear foot (meter)
Item No. 653	Thermoplastic skip traffic stripe, ___ in (mm), (color)	Per gross linear mile (kilometer)
Item No. 653	Thermoplastic pavement markings, words, and symbols (color), type _____	Per each
Item No. 653	Thermoplastic traffic stripe	Per square yard (meter)

### 653.5.01 Adjustments

General Provisions 101 through 150.

## **Section 654—Raised Pavement Markers**

### 654.1 General Description

This work includes furnishing and placing raised pavement markers according to the Plans or as directed by the Engineer. Use markers that conform to Plan shapes, dimensions, and tolerances.

#### 654.1.01 Definitions

General Provisions 101 through 150.

**654.1.02 Related References****A. Standard Specifications**

Section 868—Bituminous Adhesive for Raised Pavement Markers

Section 886—Epoxy Resin Adhesives

Section 919—Raised Pavement Marker Materials

**B. Referenced Documents**

QPL 74

**654.1.03 Submittals**

General Provisions 101 through 150.

**654.2 Materials**

Ensure that materials meet the requirements of the following Specifications:

<b>Material</b>	<b>Section</b>
Bituminous Adhesive	868
Epoxy Resin Adhesives	886
Pavement Markers	919

**654.2.01 Delivery, Storage, and Handling**

General Provisions 101 through 150.

**654.3 Construction Requirements****654.3.01 Personnel**

General Provisions 101 through 150.

**654.3.02 Equipment**

Before beginning construction, clean marker replacement equipment and ensure that it is mechanically sound.

**A. Containers and Stirring Devices**

Clean containers and stirring devices (paddles, propellers for drills, etc.) before hand-mixing epoxy.

**B. Automatic Mixing Device**

## 1. Cleaning

Clean the mixing head to the automatic epoxy mixing equipment after stopping work for any extended period of time. The length of down-time allowed depends on the pot life of the adhesive system being used.

## 2. Mixing Ratio

Use an automatic mixing device that delivers separate components to the mixing head in a one-to-one ratio by volume.

## 3. Sample Valves

Equip the lines feeding the mixing head with suitable valves to allow samples to be taken for checking the ratio of each component.

**C. Bituminous Adhesive Equipment**

Clean and maintain equipment for melting, stirring, and dispensing bituminous adhesive according to the bituminous adhesive manufacturer's requirements.

**654.3.03 Preparation**

General Provisions 101 through 150.

**654.3.04 Fabrication**

General Provisions 101 through 150.

### 654.3.05 Construction

#### A. Adhesive Types

Cement markers to pavement surfaces with a Type I-R Epoxy or Type I-S Epoxy (see Section 886), or with a bituminous adhesive (see Section 868). Space markers according to the Plans.

1. **Type I-R Epoxy.** Use Type I-R Epoxy when the pavement temperature is above 50 °F (10 °C), or when traffic conditions require a rapid setting system.
2. **Type I-S Epoxy.** Use Type I-S Epoxy when the pavement temperature is above 60 °F (15 °C) and traffic conditions permit a slower setting system.
3. **Bituminous Adhesive.** Use bituminous adhesive when the pavement temperature is above 40 °F (4 °C) or when traffic conditions require a rapid setting material.

#### B. Handling and Applying Adhesives

Obtain an epoxy adhesive furnished as two separate components. Combine and use the components as follows:

1. Immediately before use, thoroughly stir the individual components with separate paddles. Reject material permanently increasing in viscosity or showing settling of pigments, filler, or thixotropic additives that cannot be readily redispersed.
2. After stirring or agitating the two separate components, mix them in a one-to-one ratio and blend thoroughly until obtaining a uniform color without streaks.
3. At time of mixing, ensure that the temperature of both components is 60 ° to 80 °F (15 ° to 27 °C). If necessary, heat components using indirect heat to avoid locally overheating and decomposing the material. Do not heat adhesive above 120 °F (49 °C).
4. Place markers between the start of mixing the epoxy system and the termination of the pot life. The Engineer will designate the allowable pot life based on environmental factors. Never use a partially set mixed system that does not readily extrude around the perimeter of the marker when pressed to the roadway.
5. When using an approved fast-setting epoxy system, mix the separate components with a two-component type automatic mixing and extrusion apparatus, and place markers immediately.
6. Use bituminous adhesive furnished in approximately 30 lb (14 kg) cubes.
  - a. Heat the cubes in an oil-jacketed melting pot.
  - b. Maintain the bituminous adhesive at the manufacturer-recommended temperature during placement of the markers.
  - c. Discard bituminous adhesive heated above 450 °F (232 °C).

#### C. Placement of Markers

##### 1. Surface Cleaning

Clean pavement of dirt, curing compound, grease, oil, paint, moisture, loose or unsound layers, or other material that would impair the bond between the adhesive and the roadway.

- a. Use either sand-blasting or grinding equipment to clean. Remove the dust before placing the marker.
- b. Provide cleaning equipment air lines with suitable traps to prevent oil or moisture from being redeposited on the road surface.

##### 2. Placement Limits

Place markers as follows:

- a. Do not place markers over joints in rigid pavement.
- b. Do not place markers when pavement temperature is below 40 °F (4 °C).
- c. When possible, wait 60 to 90 days before placing markers using epoxy adhesive on newly constructed asphaltic concrete pavements.

##### 3. Marker Placement Using Epoxy Adhesives

Place markers using epoxy adhesives as follows:

- a. Place enough adhesive on the cleaned pavement or the bottom of the marker to completely cover the contact area of the marker.
- b. Press the marker firmly to the pavement.

- c. Allow a slight bead of epoxy adhesive to extrude from under the marker edges.
  - d. Remove adhesive on the face of the marker or adhesive that obscures the marker. Do not use thinners or solvents to clean epoxy adhesives from the markers.
4. Marker Placement Using Bituminous Adhesives
- Place markers using bituminous adhesives as follows:
- a. Place enough bituminous adhesive on the cleaned pavement or the bottom of the marker to completely cover the contact area of the marker.
  - b. Press the marker firmly to the pavement.
  - c. Allow a slight bead of adhesive to extrude from under the marker edges.
  - d. Remove adhesive on the face of the marker or adhesive that obscures the marker.
  - e. Place the marker before the bituminous adhesive cools and does not extrude around the perimeter of the marker when pressed to the roadway.

#### **654.3.06 Quality Acceptance**

Refer to QPL 74 for raised pavement markers that have met these requirements.

#### **654.3.07 Contractor Warranty and Maintenance**

General Provisions 101 through 150.

### **654.4 Measurement**

The number of each type of installed and accepted pavement marker is counted separately for payment.

#### **654.4.01 Limits**

General Provisions 101 through 150.

### **654.5 Payment**

Raised pavement markers will be paid for at the Unit Price for each Unit of each type. Payment is full compensation for furnishing and installing each marker.

When designated, payment will also include recessing the marker.

Payment will be made under:

Item No. 654	Raised pavement markers type_____	Per each
Item No. 654	Raised pavement markers type_____(recessed)	Per each

#### **654.5.01 Adjustments**

General Provisions 101 through 150.

## **Section 655—Pavement Arrow with Raised Reflectors**

### **655.1 General Description**

This work includes installing pavement arrows with raised reflectors. Mark arrows with traffic paint, thermoplastic, or preformed plastic pavement markings according to the Proposal and Plan details.

#### **655.1.01 Definitions**

General Provisions 101 through 150.

#### **655.1.02 Related References**

##### **A. Standard Specifications**

Section 652—Painting Traffic Stripe

Section 653—Thermoplastic Traffic Stripe

Section 654—Raised Pavement Markers